

Comment on **essd-2021-426**

Anonymous Referee #1

Referee comment on "Full-coverage 250 m monthly aerosol optical depth dataset (2000–2019) amended with environmental covariates by an ensemble machine learning model over arid and semi-arid areas, NW China" by Xiangyue Chen et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-426-RC1>, 2022

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Review of Full-coverage 250 m monthly aerosol optical depth dataset (2000-2019) amended with environmental covariates by the ensemble machine learning model over the arid and semi-arid areas, NW China. By Chen et al. This manuscript applies bagging trees ensemble methods to produce monthly full-coverage and high-resolution AOD product (FEC AOD). Compared with AERONET AOD, FEC AOD has good performance with an R2 of 0.79. A good analysis of spatio-temporal variability is then presented and the interpretation of environmental covariates on FEC AOD is explored using redundancy analysis. I would like to recommend minor revisions.

1. Line 33, the expression is ambiguous since the bimodal pattern usually refers to the aerosol size distribution.
2. The blank space before the reference is lacking.
3. How did you get the FEC AOD at 250m resolution? Is it simply a matter of interpolating the original input data to a resolution of 250m and then inputting it into the model to get the FEC AOD?
4. In Figure 3, please include a monthly comparison of MAIAC AOD with AERONET AOD for the same period.
5. In Line 351-352, the author concludes that FEC AOD products demonstrate a reliable accuracy and ability to capture local information, even superior to MAIAC and MxD08 AOD products. However, the loess-based seasonal trend decomposition procedure (STL) in Figure 5 does not show the advantage of FEC AOD over MAIAC AOD. If the advantage is only the spatial resolution, as described in the third point, wouldn't we be able to get any resolution with interpolation?
6. Please describe in detail the calculation of AOD uncertainty (lines 479-483).